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An Empirical Update (1969–1989) of D. L. Krantz's Thesis That the Experimental Analysis of Behavior is Isolated

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Citation data from 1970 to 1989 were examined in order to determine whether the "isolation" of the experimental analysis of behavior (EAB) that was originally documented by Krantz (1971, 1972) has persisted beyond the early 1970s. Our findings from analyses of the *Journal of the Experimental Analysis of Behavior* (*JEAB*) and of related journals support the following conclusions: (1) In the 20-year period since 1969, *JEAB* has continued to cite its own articles ("self-cite") at a higher rate than related journals; (2) *JEAB*'s self-citation rate decreased by a larger amount since 1969 than did that of related journals; and (3) *JEAB* was cited with diminishing frequency by some related journals during the 20-year period. These findings and other disciplinary comparisons provide information relevant to the issue of the health of behavior analysis and related specialties.

Key words: D. L. Krantz, citations, *Journal of the Experimental Analysis of Behavior,* isolation of experimental analysis of behavior (EAB)

About 20 years ago, D. L. Krantz (1971, 1972) examined the reference lists of published articles in order to compare communication patterns of operant and nonoperant psychology, and he concluded that the two "schools" were mutually isolated. Specifically, he suggested that the major journal of operant-conditioning research, the *Journal of the Experimental Analysis of Behavior* (*JEAB* hereafter) was isolating itself *from other approaches* because it was citing its own articles (journal-level "self-citation") at a rate significantly above that exhibited by other journals that he examined,[2] namely, the *Journal of Experimental Psychology* (*JEP* hereafter) and the *Journal of Verbal Learning and Verbal Behavior* (*JVLVB*). Krantz further suggested that operant research was being isolated *by other approaches,* the journals of which cited research published in *JEAB* less often than they cited research published in journals other than *JEAB*. Findings in Krantz's detailed interviews of operant-conditioning researchers were consistent with the idea—which he developed from his citation analysis—that the amount of communication between operant and nonoperant psychology was abnormally low.

Krantz's reports were bothersome because they implied that what seemed to be a standard account[3] of the origins of *JEAB* (to wit, that efforts of researchers in the operant-conditioning field to participate and publish in the "behavior theory and animal conditioning" mainstream had been rebuffed, and that this exclusionary practice had necessitated the creation of a specialty journal, *JEAB,* as a publication outlet) was incomplete or inaccurate for implying that the mainstream was primarily responsible for the low volume of communication between the two "schools." Moreover, Krantz's articles appeared just after a searching appraisal of the experimental analysis of behavior (hereafter: EAB) by J. R. Kantor (1970) and seemed to offer empirical confirmation of Kantor's allegations of

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[2] Garfield (1977), making use of citation data from 77 journals classified as "Psychology" or "Behavioral Science" in the 1969 *Science Citation Index* (i.e., in the time period of Krantz's data), reported that *JEAB*'s self-citation rate of 42.9% was the highest of these 77 journals.

[3] For instance, see Krantz (1972, pp. 90–93), and Skinner (1983, p. 138). See also the special section on the history of *JEAB* which appeared in that journal in 1987, Volume 48, pp. 439–494.

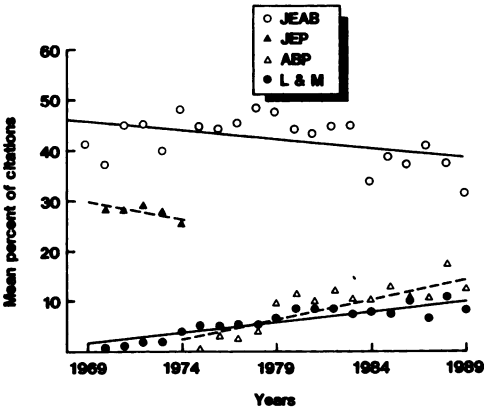

Figure 1. Mean percentage of self-citation for *Journal of the Experimental Analysis of Behavior* (*JEAB*) and for three comparison journals (see text) published between 1976 and 1989. Straight lines are fit by a least-squares technique to their data points.

narrowness and other endogenous difficulties.

Subsequently, Krantz's articles have been used as evidence for a sharply critical historical appraisal of Skinnerian radical behaviorism (e.g., Leahey, 1987, p. 385); a similar verdict was elaborated, with appeal to Krantz's findings, in the fifth edition of *Theories of Learning* (Bower & Hilgard, 1981, pp. 209–210), a book widely regarded as authoritative (Littman, 1982; for a similar appraisal of the fourth edition, see Kimble, 1975). According to the *Social Science Citation Index* (hereafter *SSCI*), at least one of Krantz's two papers was cited in 47 different articles between 1973 and 1989, the number of citations decreasing smoothly over the period (figure not shown). In 64% of these references, the authors understood Krantz's paper(s) to imply that EAB is in an unhealthy or unfavorable state. (The majority of the remainder of these references to Krantz's papers were evaluatively neutral or ambiguous.)

The theme of "isolation" is still a topic of concern in the present-day disciplinary grouping called behavior analysis (e.g., Lee, 1989), and, despite the fact that Krantz's data are now over 20 years old, his articles are used as a basis for concluding that operant psychology (or behavior analysis, if we are to identify its present-day successor) is still isolated. This anachronism inspired the present study, which made use of citation data between 1969 (the endpoint of Krantz's study) and 1989 in order to determine whether or not the contrasting citation practices that Krantz described earlier have persisted. Specifically, we examined (1) self-citation in *JEAB* and in comparison journals, and (2) references to and from *JEAB* and neighboring journals in the animal-learning/behavior-theory field. It was our hope to contribute a more up-to-date basis for discussing the presumptive "isolation of operant psychology."

METHOD AND RESULTS

Extending the Time-Frame of Krantz's Investigation

From each article published in *JEAB* from 1969 through 1989, we calculated the proportion of references to *JEAB* articles and then calculated annual means[4] for 1969 through 1989. We also compared our calculated values with self-citation percentages for various psychology journals that have been reported annually by the *SSCI* since the mid-1970s. We found that the two sets of values were comparable[5] and that the comparability

[4] This journal-level "self-citation" percentage varied from article to article in *JEAB*, but the annual distributions were approximately symmetrical (figure not shown); we concluded that the mean of the distribution is an acceptable summary statistic. By contrast, the distribution for *Journal of Experimental Psychology* skewed toward higher percentages, a circumstance that made the mean numerically higher than the more appropriately chosen median. We decided to retain the mean and regard as conservative our significance tests for differences in self-citation rates of *JEAB* and other journals.

[5] For reasons that can only be guessed at, the 1975 self-citation value provided for *JEAB* by *SSCI* was substantially higher than the value obtained from reference-list counting. For 1976–1989, however, the two sets of values were very comparable, correlating .95, an impressive correlation considering the restricted range of scores; the means of the two sets differed by less than a percentage point. Therefore, for the journals with which we compare the citation practices of *JEAB* authors, we used the self-citation values, when available, that are provided by *SSCI* in the annual *SSCI Journal Citation Reports* volume.

TABLE 1

Mean rate of self-citation and slope of least-squares line in eight journals

Journal	Rate	Slope
Figure 1 data		
Journal of the Experimental Analysis of Behavior (JEAB)	41.9	−0.36
Journal of Experimental Psychology (JEP)	27.6	−0.63
Learning and Motivation (L&M)	6.0	+0.43
JEP: Animal Behavior Processes (ABP)	9.1	+0.80
Additional comparisons, 1976–1989*		
Journal of the Experimental Analysis of Behavior	40.4	−1.12
Psychological Review	6.8	0.00
American Psychologist	9.8	0.00
Psychological Reports	5.1	0.00
American Journal of Psychology	4.7	0.00

* Mean rate obtained from annual self-citation percentages provided by *SSCI* for 1976–1989.

warranted our use of *SSCI* values for other journals in the comparisons below. Therefore, we obtained manually calculated values for 1969–1974 and *SSCI* values for 1975–1989 from a few comparison journals, namely *JEP, Learning and Motivation* (*L&M* hereafter), and *Journal of Experimental Psychology: Animal Behavior Processes* (*ABP* hereafter); we plotted these mean percentage values in Figure 1. Straight lines were fit to their data points by a least-squares routine (Klein, 1985).

Figure 1 suggests that the rate of self-citation was higher for *JEAB* than for *JEP* and much higher than the rate for the two animal-learning journals. To facilitate statistical comparisons, the mean self-citing rate and the slope of the fitted line are presented in the top portion of Table 1 for the journals displayed in Figure 1. Separate t tests for weighted means confirmed the statistical significance of the differences between *JEAB* and *L&M* ($t = 22.9, p < .0001$) and between *JEAB* and *ABP* ($t = 17.0, p < .0001$). The *JEAB–JEP* difference for the 1969–1974 period was also statistically significant ($t = 7.39, p < .001$). It is clear, then, that the frequency of self-citation for *JEAB* is well above that for other journals in nearby behavioral, physiological, and experimental-psychology specialties. This finding extends Krantz's original observations nearly to the present.

On the other hand, the best-fit line for *JEAB* self-citation in Figure 1 has a negative slope (as does the short segment for *JEP* before its subdivision into four subjournals in 1975). To ascertain how the decline (negative slope) in *JEAB* self-citation compares to the self-citation behavior of other psychological journals in this period, we obtained self-citation percentages from *SSCI* from 1976 to 1989 for *JEAB* and for another set of comparison journals chosen simply because of their heterogeneity: *Psychological Review, American Psychologist, Psychological Reports,* and *American Journal of Psychology.* The yearly percentages were plotted, and a least squares line was fit to each data set; the figure is not shown, but the means and slopes for each of the four journals are presented in the bottom portion of Table 1. From 1976 to 1989, the four journals self-cited at a lower frequency than did *JEAB,* but their rates of self-citation did not change markedly. The rate of self-citation exhibited by *JEAB* decreased in the same period; a slope of −1.12 presented in Table 2 reflects a decrease from a high of 45.7% in 1976 to 30.4% in 1989 (figure not shown). Therefore, while other journals did not change their journal self-citation practices, *JEAB* authors reduced their rates of journal self-citation by a comparatively large amount from the mid-1970s to the late 1980s.

In addition to examining self-citation for the purpose of assessing *JEAB*'s use of its own articles, Krantz (1971) addressed the issue of the use of *JEAB* ar-

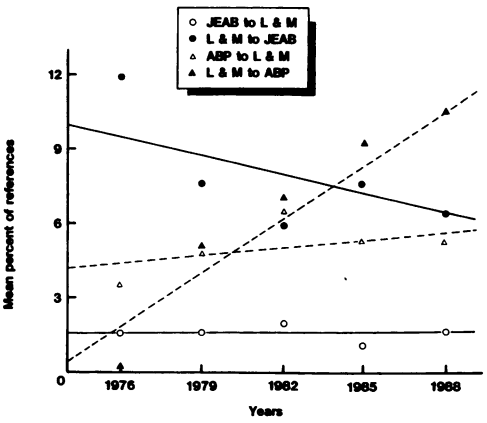

Figure 2. Mean percentage of references to and from *Learning and Motivation* (*L&M*) by *Journal of the Experimental Analysis of Behavior* (*JEAB*) and by *Journal of Experimental Psychology: Animal Behavior Processes* (*ABP*) published between 1975 and 1989. Each point is the mean of a 3-year block. Straight lines are fit to their data points by a least-squares technique.

ticles by other journals. He examined a statistic he called "mean percent reciprocal citation." This statistic is simply the proportion, out of all items in reference lists of a neighboring journal, of references to *JEAB* articles. Krantz found that, for the *Journal of Comparative and Physiological Psychology* (hereafter, *JCPP*), these percentages were only 1.5% and 1.7% for 1968 and 1969, respectively, significantly lower than the values for utilization of literature in *JVLVB* by *JEP* authors. Krantz presented these data as support for his diagnosis of the "isolation" that the journal-level self-citation data suggested.

It would have been appropriate for us to extend the same comparisons into the subsequent 20-year period, and we did so in part, although the division of *JEP* into four subjournals in 1975 made it infeasible to continue Krantz's *JVLVB–JEP* comparison. We calculated "mean percent reciprocal citation" for 1969 (to check Krantz's value of 1.7%), and for subsequent years up to 1989, for *JEAB* citations in *JCPP* articles, given that Krantz had determined that *JCPP* was *JEAB*'s primary source of citations in the 1960s. The resulting data (figure not shown) revealed that the proportion of references to *JEAB* in *JCPP* remained in the 1–2% range from 1969/1970 to 1989.[6] Therefore, from our self-citation and reciprocal-citation data, we conclude that the main findings Krantz reported in 1971 and 1972 have persisted through the subsequent two decades, in spite of a comparatively large decrease in *JEAB*'s self-citing rate.

Additional Comparisons

The publication of new animal-learning journals in the 1970s suggested comparisons that Krantz could not carry out. Two of these journals were: *L&M*, the first issue of which appeared in 1970, and *ABP*, which began publishing in 1975 after *JEP* divided into four separate journals. According to Krantz, his respondents expected *L&M* to become the primary source of articles that *JEAB* authors would cite in future years (Krantz, 1971, p. 62, footnote 7). Given that *ABP* is in the same subfield of animal conditioning and behavior theory in which *JEAB* is located, we compared *JEAB* and *ABP* in terms of their references to *L&M* and their citations by *L&M* authors,[7] making use of the annual values provided by the *SSCI*. We examined overall percentages as well as chronological changes (slope of best-fit line) in the percentages. The resulting graphs appear in Figure 2, which displays citation frequencies to and from *L&M* by *JEAB* and *ABP*, with each data point indicating the mean of that three-year period (the figure displaying annual data was too cluttered to present) and with least-squares lines drawn to the data points. Table 2 provides a summary of the figure by presenting overall means

[6] The mean percentage of *JCPP* references to *JEAB* fell from 1.7% in 1970–1974 to 0.9% in 1985–1989. (The journal split in 1983, and we obtained references only from *Journal of Comparative Psychology* for 1985–1989.)

[7] The following terminology is fairly standard: A *reference* is made in the reference list of the "source" publication to a second, typically previously published "target" item. The first ("source") publication has *cited* the second ("target"), and the second has thereby garnered one *citation*.

TABLE 2

Mean percentage of references from first to second journal (Krantz's "reciprocal citation" percentage) and slope of least-squares line in selected journals for 1975-1989*

References	Percentage	Slope
From *JCPP* to *JEAB* (1969–1989)	1.1	−0.04
From *L&M* to *JEAB*	7.5	−0.25
From *JEAB* to *L&M*	1.5	+0.01
From *L&M* to *ABP*	6.7	+0.75
From *ABP* to *L&M*	5.1	+0.11
From *JEAB* to *ABP*	1.8	+0.29
From *ABP* to *JEAB*	8.5	+0.05
From *JEAB* to *ALB*	2.0	+0.16
From *ALB* to *JEAB*	9.1	−0.04

* See text for abbreviations of journals.

and slopes for each set of references (i.e., Krantz's "reciprocal citations").

An examination of Figure 2 reveals that the percentage of references by *L&M* to *JEAB* was high in the mid-1970s but dropped steadily, whereas referencing by *JEAB* to *L&M* remaining low for the entire period. References from *ABP* to *L&M* increased somewhat, whereas that from *L&M* to *ABP* increased from near zero to 11%. An interpretive summary would indicate that communication between *L&M* and *JEAB* weakened in the period from 1975 to 1989, whereas communication between *L&M* and *ABP* grew stronger.

Having examined relationships to *L&M*, which Krantz's respondents seem to have tried to anticipate, we also addressed the *JEAB–ABP* relationship by obtaining from *SSCI* tables the frequency (percentage) of references from one journal to another. We plotted the data, fit straight lines, and tested the significance of the differences between the yearly mean frequency (percentage) of *JEAB*-to-*ABP* and of *ABP*-to-*JEAB* references in the 1975–1989 period. (The figure is not shown, but the summary data appear in lines six and seven of Table 2.) We found that *ABP* utilized *JEAB* articles at a rate (mean = 8.5%) that was significantly higher than the frequency (mean = 1.8%) of the reverse case ($t = 6.11$, $p < .001$). The frequency of *ABP*-to-*JEAB* references increased very slightly during the period, as did the frequency of *JEAB* utilization of *ABP* literature.

Finally, at the suggestion of a reviewer, we examined citations to and from *JEAB* and *Animal Learning and Behavior* (hereafter, *ALB*), which began publishing in 1973. The bottom two rows of Table 2 indicate that the frequency of reference from *ALB* to *JEAB* (9.1%) was substantially higher than the converse case (2.0%)—a difference that was statistically significant ($t = 12.5$, $p < .001$)—and that it did not change much during the period; there was a small increase in the frequency of reference from *JEAB* to *ALB*. These findings are comparable to those we reported for the other animal-learning journals that we examined.[8]

DISCUSSION

Our findings indicate that the contrasting self-citation and mutual-citation practices that were reported by Krantz (1971, 1972) have largely persisted in the

[8] Our choice of journals was affected by the wish to extend Krantz's study chronologically and to remain close to the framework of his study, which involved comparison of *JEAB* and related animal-psychology journals. It may be that in the last 20 years other disciplinary areas have become linked to behavior analysis and that references to and from their disciplinary journals and *JEAB* (and perhaps *The Behavior Analyst*) could profitably have been examined. Such possibilities had no precedent in Krantz's publications and were, therefore, not a part of our research plan.

20 years from 1970 to 1989. Readers who were disturbed by Krantz's findings should, in spite of the ameliorative trends that we described, be disturbed by the results of our study. Krantz used the evaluatively loaded term "isolation" to describe the low volume of communication, and he and many of his readers have taken that isolation to be indicative of disciplinary pathology in "operant psychology."

On the other hand, it is worth emphasizing that "pathology" interpretations rest on the *assumption* that the volume of communication from within a specialty to targets beyond the specialty is the most important indicator of the health of that specialty. Other indicators, such as a variety of disciplinary growth measures, have also been widely used as indicators of the health of the specialty (e.g., Price, 1961; Tague, Beheshti, & Rees-Potter, 1981). Some of these indicators support a conclusion regarding the health of "operant psychology" and its disciplinary relatives (e.g., Wyatt, Hawkins, & Davis, 1986) that controverts the "Krantzian" thesis that operant psychology was/is in bad health.

Moreover, it is important to remember that Krantz's investigation—and the widely stated interpretation of its findings, to the effect that EAB is in an unhealthy state—came out of an historically situated "ideology" regarding scientific progress in general and the progress of psychology in particular.[9] Scientific communication was widely regarded as the sine qua non of scientific progress; low frequency of citation beyond one's own specialty, for any of a variety of incompletely understood reasons, was taken to indicate impaired communication, and that state was thought to be pathological.

Finally, a note of methodological caution is required. Recall that Krantz had inferred "isolation" largely (but *not exclusively*) from journal-level self-citation data. Although high self-citation rates "seem to say *something* about the newness, size, and isolation of the intellectual universe in which a journal operates" (Garfield, 1979, p. 150, emphasis added), journal self-citation is a poorly understood phenomenon. Garfield's (1977) table of self-citation data reveals no simple relationship between a journal's self-citation rate and its position on an impressionistic generalist-specialist continuum.[10] Furthermore, very high self-citing rates are found in journals of some apparently healthy hard-science specialties: Garfield reported high self-citation rates in cancer journals, several above 50% (Garfield, 1979, Figure 9.39), and he found a restricted pattern of citations, along with high journal self-citation rates, in major crystallography journals (p. 187). Accordingly, it seems proper to emphasize that journal-level self-citation is a complexly determined, molar-level feature of scientific information usage, the proper interpretation of which has not been agreed upon (see also Garfield, 1979, p. 198). The matter is susceptible to further empirical study; a study of reference practices of authors who regularly publish in *JEAB* would be interesting, and the results of such a study may clarify the implications that can be drawn from high rates of journal-level self-citation.

Consequently, whether our findings *should* cause concern among behavior analysts as an entire group (or only among EAB researchers[11]) is not a question with

[9] For example, see Krantz (1971, pp. 101–102, 1972, pp. 64–65). The idea that the progress of psychology depends on communication animated the numerous *Reports* of the American Psychological Association's Project on Scientific Information Exchange in Psychology that were published in the 1960s.

[10] In Garfield's (1979) Table 9.43, a specialist journal, *Psychometrika,* ranked second with a self-citing rate of 36.3%, whereas a generalist journal, *Psychological Review,* had a rate of only 3.4%. Yet *Animal Behaviour* and *Journal of Mathematical Psychology,* which would appear to be specialty journals, self-cited at a low rate, below 11%. There is no *consistent* relationship between a journal's specialist status and a high self-citation rate.

[11] The distinction between behavior analysis and EAB is not typically appreciated by outsiders, who treat as equivalent a variety of labels that include "Skinnerian theory," "radical behaviorism," "operant psychology," and "operant conditioning." The distinction is important because it helps bring into focus the possibility of greatly differentiated roles for EAB and for other behavior-analytic specialties.

a simple, a priori answer, but we hope our cautions will not completely inhibit discussion. Given that referencing/citing of literature is a multiply determined practice (e.g., Cronin, 1981, 1982; Gilbert, 1977), some of the factors of "isolation" may be desirable (e.g., intradisciplinary self-sufficiency, consensus, focus, etc.), whereas others are undesirable (e.g., failure to expand foreign markets for the discipline's intellectual products) *with respect to agreed-upon disciplinary objectives.* Identifying the most important of these objectives is the prerogative of the members of the discipline, who typically arrive at a consensus through opinion exchange. Given that there exists an ongoing discussion of the "isolation" of behavior analysis, the readership of *The Behavior Analyst* may find our results useful and provocative.

REFERENCES

Bower, G. H., & Hilgard, E. R. (1981). *Theories of learning* (5th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Cronin, B. (1981). The need for a theory of citing. *Journal of Documentation, 37,* 16–24.

Cronin, B. (1982). Norms and functions in citation: The view of journal editors and referees in psychology. *Social Science Information Studies, 2,* 65–78.

Garfield, E. (1977). Current comments: Journal citation studies. 19. Psychology and behavior journals. In E. Garfield (Ed.), *Essays of an information scientist* (Vol. 2, pp. 231–235). Philadelphia, PA: Institute for Scientific Information Press.

Garfield, E. (1979). *Citation indexing—Its theory and application in science, technology, and humanities.* New York: Wiley.

Gilbert, G. N. (1977). Referencing as persuasion. *Social Studies of Science, 7,* 113–122.

Kantor, J. R. (1970). An analysis of the experimental analysis of behavior (TEAB). *Journal of the Experimental Analysis of Behavior, 13,* 101–108.

Kimble, G. A. (1975). Required reading for the profession [Review of E. R. Hilgard & G. H. Bower, *Theories of learning,* 4th ed., 1975]. *Contemporary Psychology, 20,* 613–614.

Klein, J. B. (1985). *XY.COM* (ver.1.2) [A user-supported shareware computer-graphics program]. Raleigh, NC: National Collegiate Software Clearinghouse.

Krantz, D. L. (1971). The separate worlds of operant and nonoperant psychology. *Journal of Applied Behavior Analysis, 4,* 61–70.

Krantz, D. L. (1972). Schools and systems: The mutual isolation of operant and non-operant psychology as a case study. *Journal of the History of the Behavioral Sciences, 8,* 86–102.

Leahey, T. H. (1987). *A history of psychology* (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Lee, V. L. (1989). In response: Comments about the isolation of behavior analysis. *The Behavior Analyst, 12,* 85–87.

Littman, R. H. (1982). Excelsior [Review of G. H. Bower & E. R. Hilgard, *Theories of learning,* 5th ed., 1981]. *Contemporary Psychology, 27,* 95–96.

Price, D. De Solla (1961). *Science since Babylon.* New Haven, CT: Yale University Press.

Skinner, B. F. (1983). *A matter of consequences.* New York: Knopf.

Tague, J., Beheshti, J., & Rees-Potter, L. (1981). The law of exponential growth: Evidence, implications and forecasts. *Library Trends, 30,* 125–149.

Wyatt, W. J., Hawkins, R. P., & Davis, P. (1986). Behaviorism: Are reports of its death exaggerated? *Behavior Analyst, 9,* 101–105.

For instance, "isolation" of EAB (or other special-interest areas) may be tolerable, or even approvable, to a degree that is unimaginable for specialties whose mission is to expand the utilization of behavior-analytic ideas and methods by outsiders.